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CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

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8 April 1974

MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT : MILITARY THOUGHT (USSR): The Use of Tables
for Planning and Evaluating Nuclear Strikes


1. The enclosed Intelligence Information Special Report is part of a series now in preparation based on the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal 'Military Thought'. This article asserts that computers are inadequate for planning and evaluating the effectiveness of nuclear strikes. Using the BESM-3M and Minsk 22 computers, it is said to take 15 hours to perform the necessary operations. The authors propose instead the use of tables which they have created. The sample table presents nominal data for the employment of the R-300 (SCUD) missile at various ranges and yields against representative enemy units. This article appeared in Issue No. 3 (88) for 1969.

2. Because the source of this report is extremely sensitive, this document should be handled on a strict need-to-know basis within recipient agencies.


William E. Nelson
Deputy Director for Operations

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Intelligence Information Special Report

COUNTRY USSR

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DATE OF
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DATE 8 April 1974

SUBJECT

MILITARY THOUGHT (USSR): The Tabular Method of Making Operational-Tactical Calculations for Estimating the Effectiveness of Nuclear Strikes

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 3 (88) for 1969 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal 'Military Thought'. The authors of this article are Colonel V. Turchenko, Candidate of Military Sciences, and Engineer Colonel N. Bazanov. This article asserts that computers are inadequate for planning and evaluating the effectiveness of nuclear strikes. Using the BESM-3M and Minsk 22 computers, it is said to take 15 hours to perform the necessary operations. The authors propose instead the use of tables which they have created. The sample table presents nominal data for the employment of the R-300 (SCUD) missile at various ranges and yields against representative enemy units.

End of SummaryComment:

Colonel V. V. Turchenko co-authored with M. V. Pedulov a book entitled Defensive Operations in the Course of the Offensive, Military Publishing House, 1966. Engineer Col. N. Bazanov wrote an article describing network methods of planning and possible applications of this method to military problems, Red Star, 2 October 1965. He is also co-author with Col. V. Vaneyev of an article entitled "Information Theory and Control of Troops". Military Thought has been published by the USSR Ministry of Defense in three versions in the past -- TOP SECRET, SECRET, and RESTRICTED. There is no information as to whether or not the TOP SECRET version continues to be published. The SECRET version is published three times annually and is distributed down to the level of division commander.

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The Tabular Method of Making Operational-Tactical Calculations
for Estimating the Effectiveness of Nuclear Strikes

by

Colonel V. Turchenko, Candidate of Military Sciences
and Engineer Colonel N. Bazanov

At the present time, operational-tactical calculations are made on the basis of operational exercises and war games in the military districts and academies and with the use of various calculating means: electronic computers and keyboard calculators (EVM and SKM), tables, slide rules, special devices, graphs, and nomographs. In doing so, particular attention is given to using these means for calculating the estimated effectiveness of nuclear strikes being planned and delivered both by our troops and by the enemy. This is bound up with the fact that it is precisely these calculations which make it possible to determine the relative strengths of the two sides (overall and by axes), which in turn is necessary in order to make decisions regarding further actions of the troops.

The advisability of using tables to make such calculations is dictated by the fact that the presently existing machine methods, despite all of their positive qualities and the advantage that they provide, have still not been adequately perfected. Their use often involves very complicated work by operating personnel and an intolerably great loss of time in preparing the input data and processing the solutions, even though the calculations themselves are made very rapidly by electronic computers.

For example, about twelve to fifteen hours are required to determine the effectiveness of a mass nuclear strike by a front (120 to 150 nuclear warheads) using the stationary electronic computers BESM-3M and Minsk-22. It takes five to six hours to fill out the request form directly from a map (preparation of input data for the calculations); one to two hours for the transfer of input data onto a punch tape or punch cards and for the calculating; about one hour for filling out the response form (for the results of the calculations); and five to six hours for processing the results, either by hand or using keyboard calculators (conversion of losses from percentages to numerical quantities for targets being destroyed, and totalling of losses for large units and operational formations). Additional time is lost in forwarding the input data from the command post of the front to the computer station and sending back the results.

This information, of course, applies to the general-purpose stationary electronic computers which are now in use in the armed forces. When

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special-purpose electronic computers are introduced into the troops, the problem of rapid carrying out of calculations will be resolved differently in many respects.

When the staff of a front has only a limited time in which to plan a nuclear strike, the use of existing machine methods in the process mentioned above is, practically speaking, ruled out. This is fully confirmed by actual experience in war games, in which it has been impossible, in planning operations, to calculate the estimated effectiveness of an initial nuclear strike by a front within the allotted time. Preparation time is even more limited when a front has to deliver a nuclear strike during the course of an operation. Making such calculations with electronic computers in accord with existing methods is justified only in the training process, in scientific-research work, and in peacetime planning of operations, while in combat actions it is justified only for calculating the estimated effectiveness of group nuclear strikes (using a small quantity of warheads).

In order to shorten the time needed to prepare the input data for electronic computer calculations, use is sometimes made of averaged values for: the probable deviation (average launch range of missiles), the yield of nuclear warheads, and the dimensions of typical targets as derived from their status (level of strength). However, in this case the results of the calculations are flawed with great inaccuracy--up to five to seven percent in expressing the losses of each destroyed target.

The foregoing was also the basis for concluding that it is advisable to work out and use special tables for making calculations. In doing so, the primary purpose was to gain time--to provide for making calculations in a shorter time, and also to simplify the process and preserve accuracy. This applies mostly to calculations for estimating the effectiveness of an initial massed nuclear strike of a front, both one being planned and also one already delivered at the beginning or during the course of an offensive operation.

The tables proposed by the authors have been worked out on the basis of the machine methods of solving the corresponding calculation tasks. In order to compile the tables, we have carried out numerous electronic computer calculations to estimate the effectiveness of the destruction of various targets, taking into account the dimensions of the targets (as derived from their location and status), the yield of the nuclear warheads with which the troops are armed, and various probable deviations (circular errors probable) determined by the launch range of the missiles.

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Having such tables, in essence, front staffs acquire the capability to determine the effectiveness of nuclear strikes (by their own troops or by the enemy) relatively quickly and accurately. The forms of the tables can vary in accordance with the parameters used as a base: standard targets, yields of nuclear warheads, launch range of missiles, and the magnitude of probable deviation. Composite tables can also be drawn up taking all of these parameters into account.

The procedure for preparing the proposed tables boils down to the following (see Table 1).

First of all one must determine a list of standard targets (objectives), each of which is usually destroyed by a single nuclear strike (missile, antiaircraft, and artillery batteries; tank, motorized infantry, and infantry battalions; command posts; airfields; etc.). One can also take targets which require several nuclear strikes each for destruction (missile, antiaircraft, and artillery battalions; tank, motorized infantry, and infantry brigades, and even divisions). This is permitted in those instances when the location of their subunits (batteries, battalions) is not known at the time the strike is delivered. A list of standard targets is entered in column 2.

For each target one must establish the dimensions in kilometers, by extent and by depth (in accordance with location and status), and enter them in columns 3 and 4. For example, if a full-strength tank battalion on the march forms a column four to five kilometers in depth, then, at sixty to seventy percent of full strength, the column will be correspondingly shorter, covering 2.4 to 3.5 kilometers.

Column 5 indicates the main vulnerable elements of each target, the degree of destruction which must be calculated. For each target we have taken only two such elements, the destruction of which will cause the target to lose its combat effectiveness. For rocket troops, for example, these two elements are the launchers with their missiles and the personnel of rocket subunits; for artillery--the guns and the personnel; for tank battalions--the tank crews and the tanks; for motorized infantry-- the personnel, in their armored personnel carriers (on the march or on the offensive) or in shelters; for air defense troops--the launchers with antiaircraft missiles or antiaircraft guns and the personnel of the subunits; for aviation--the personnel and aircraft on airfields; for command posts--the personnel and means of communications; etc.

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In columns 6 through 20 are entered the results of the electronic computer calculations of the degree of destruction of the vulnerable elements of each target, expressed in percentages and taking into account the launch range of missiles of each specific type and the yields of the nuclear warheads available for arming them. As can be seen from Table 1, the launch range of an R-300 missile is given in multiples of fifty kilometers. If the actual range should lie in between, say 125 kilometers, then to determine the degree of destruction of the targets, it is sufficient to take an average of the losses obtained for 100 and 150 kilometers. Tables can be set up for missile launch ranges in multiples of twenty-five, ten, and even five kilometers.

Similar tables were compiled for three types of operational-tactical and tactical missiles (the R-900, the R-300, and the R-65), for the nuclear means of front aviation (taking into account both ground and air bursts), and also for enemy nuclear means (the Pershing, Sergeant, Lance, and Honest John missiles; atomic artillery; and tactical aviation). The latter are required for determining the effectiveness of enemy nuclear strikes on the troops and targets of the front. Thus, up to ten tables in all are required in the operations directorate of the front staff.

For convenience in using the tables in determining the effectiveness of a massed nuclear strike, the operations directorate of the front staff, should have a register of the combat strength of the enemy troops, which is prepared and partially filled out ahead of time. Its form is given in Table 2.

In planning a nuclear strike or upon receipt of information on a strike which has been delivered, data from the aforementioned tables are entered in the register.

The procedure for filling it out is as follows.

In column 2 there is cited a list of targets, and the corresponding lines are intended for the summary data for each large unit (unit). In columns 3 and 4, 9 and 10, 15 and 16, etc., there is given the quantity of forces and means (expressed both as percentages and in numerical quantities) for each target, large unit, and operational formation, as well as for the overall number of troops at the disposal of the enemy prior to the delivery of a nuclear strike of the front. All of these columns are filled in in advance on the basis of the information available on the enemy at a certain time.

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In planning a nuclear strike or after it has been delivered, columns 5, 11, 17, etc. are filled in with data which in accordance with the appropriate parameters, can be obtained from the tables. After its conversion, columns 6, 12, 18, etc., are filled in. In columns 7 and 8, 13 and 14, 19 and 20, etc., there are entered data (in percentages and numerical quantities) on the quantity of forces and means remaining at the disposal of the enemy after a nuclear strike has been delivered against him. Summary information on losses and on the presence of forces and means after a strike is obtained by simply adding up the appropriate data for the individual targets.

In order to obtain a complete picture of the results of a nuclear strike of a front, columns can be added to the form of the register for indicating the quantity and yield of nuclear strikes delivered against each unit, large unit, and operational formation of the enemy.

Such a register is also compiled on the combat strength of a front. Both registers can reflect not only the overall strength of the front and the enemy but also the forces of the two sides by the axes of attack.

Consequently, the proposed methodology for making calculations to estimate the effectiveness of nuclear strikes boils down to filling out the registers of the combat strength of our troops and of the enemy on the basis of data from tables which have been previously worked out using electronic computers, and also on the basis of the collated results of nuclear strikes against large units, operational formations, and the troops as a whole, obtained by summing up (with keyboard calculators or by hand) the results of nuclear strikes delivered against individual targets (objectives). Collated data on the losses and on the surviving forces and means of both sides are also necessary input materials for the commander and staff of a front in determining the relative strengths of the two sides and in adopting a decision on subsequent actions of the troops.

The use of a tabular methodology for making calculations is entirely possible not only at the front level but also at the army, corps, and division levels. It requires nine tables to do this for an army (the same as for a front, with the exception of the table for the R-900), while six tables are needed for a corps or division.

Experience of using the tabular methodology in war games has shown that calculations to estimate the effectiveness of a massed nuclear strike can be made within a sufficiently short time. Thus, for example, only about three hours are required to estimate the effectiveness of a nuclear strike of a front using eighty nuclear warheads.

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As is obvious from its description, the tabular methodology is very simple, does not envisage complicated computations, and does not require special training of generals and officers. In using it, the same precision in calculations is achieved as would be with the use of electronic computers.

In addition to gaining time, the proposed tabular method has numerous other advantages, including: convenience for the operating personnel--all of the data necessary for the calculations are at their fingertips; the capability to make calculations simultaneously for several large units and operational formations with the participation in the work of the required number of responsible persons; reliability of calculations, since there is no need to fear the interruption or failure of electronic computers or delays in the forwarding of calculation results to the command post from the computer station; and the capability to calculate the effectiveness of a nuclear strike at the same time that it is planned, whereas, under the present procedure of using machine methods, the planning of a nuclear strike and the estimating of its effectiveness are done in sequence.

Determining the most advantageous variant for a nuclear strike requires counting up only those single strikes which have not been provided for in other variants (and not each variant in full).

The tables can be used for a relatively long period of time. As new means of destruction with different tactical-technical characteristics appear in the arsenal, the basic (input) parameters and other data for the tables will have to be refined, which will not be particularly difficult. It will also be necessary to introduce corresponding changes into the tables with the improvement of methods for making operational-tactical calculations with the use of electronic computers.

Thus, military districts, fronts, and armies can use the aforementioned tables successfully in making operational-tactical calculations, especially when they lack electronic computers. As already indicated, this provides increased efficiency in their work.

It appears advisable to continue research in this field for the purpose of finding specific ways to improve existing methods and to work out new machine and tabular methods for calculation tasks in determining results of the use of not only nuclear weapons but also chemical and conventional weapons. Our task is to attain a sharp reduction in the time required to make operational-tactical calculations.

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Table 1

2	1	No. in sequence	Target (objective of destruction)	Dimen- sions of targets (in km)	By extent	By depth	Main vulner- able element	Degree of destruction of vulnerable elements (in percentages)									
								Range = 50 km Probable deviation = 0.2	Range = 100 km Probable deviation = 0.35	Range = 150 km Probable deviation = 0.45	Range = 200 km Probable deviation = 0.5	Range = 250- 300 km Probable deviation = 0.55	Range = 300 km Probable deviation = 0.55	Range = 350 km Probable deviation = 0.55	Range = 400 km Probable deviation = 0.55	Range = 450 km Probable deviation = 0.55	Range = 500 km Probable deviation = 0.55
Tank battalion on the march etc.	Pershing battery at launching site	0.4	0.3	Personnel in shel- ters	100	100	100	20	40	100	20	40	100	20	40	100	20
								40	100	100	40	100	100	40	100	100	40
Tanks	Personnel in tanks	0.02	4.0	Launchers and mis- siles	100	100	100	20	40	100	20	40	100	20	40	100	20
								40	100	100	40	100	100	40	100	100	40

Destruction of Enemy Targets with an R-300 Missile (Type of Burst: Air)

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Table 2

Register of the Combat Strength of the Enemy Troops

No. in sequence	Large units, units, and subunits	Personnel						Launchers for operational-tactical missiles	Launchers and atomic artillery	Tanks	Field artillery	Air defense means	Aviation
		Present before nuclear strike		Losses from nuclear strike		Present after nuclear strike							
		percent	number	percent	number	percent	number						
1	2	3	4	5	6	7	8	9-14	15-20	21-26	27-32	33-38	39-44
	<u>Rocket Troops</u>												
	Pershing battalions:												
	Sergeant battalions:												
	Total in Rocket Troops:												
	<u>Air Defense Troops</u>												
	Total in Air Defense Troops :												
	<u>Aviation</u>												
	Airfield No. :												
	Total in Aviation :												
	<u>Ground Forces</u>												
	Infantry divisions - total :												
	Motorized infantry divisions - total :												
	Tank battalions												
	Motorized infantry battalions												
	Rocket battalions												
	Artillery battalions												
	Command post												
	Tank divisions - total:												
	Total in Ground Forces:												
	Total in enemy troops:												

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